

LISTS OF SPECIES

Squamate Reptiles from Parque Nacional das Emas and surroundings, Cerrado of Central Brazil

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Abstract

We present a list of squamate reptiles from *Parque Nacional das Emas* (PNE), ten neighbor private properties and *Parque Estadual Nascentes do Rio Taquari*, states of Goiás, Mato Grosso, and Mato Grosso do Sul. The study area encompasses the headwaters of Araguaia and Taquari river basins and part of Paranaíba River Basin, resulting in significant habitat heterogeneity. Inside PNE, we recorded 74 squamate species: 47 snakes, 21 lizards and six amphisbaenians. If we consider also the neighboring areas, richness value raises to 87 species: 54 snakes, 27 lizards and six amphisbaenians. From these, 52 % of the lizards, 19 % of the snakes and 33 % of the amphisbaenians are Cerrado endemics. Forest-specialist species are more common outside than inside PNE. Additional species are expected to occur in the PNE region, in view of their known geographical ranges.

Introduction

The first comprehensive published research on Cerrado herpetofauna recorded 47 lizards, 107 snakes and 15 amphisbaenians for the biome (Colli et al. 2002). Recently, more detailed studies based on systematized data revealed that at least 237 Squamate species are found in the region, including at least 68 lizards, 145 snakes and 24 amphisbaenians (Costa et al. 2007).

Nevertheless, despite the high potential local richness values (Costa et al. 2007), *Cerrado*

herpetofauna is still considered poorly sampled because studies are mostly located in few restricted areas.

In a local scale, lizard assemblages are better characterized in literature than snakes or amphisbaenians, and richness varies greatly among areas, ranging from 15 species in *Parque Nacional da Bodoquena* region ($20^{\circ}32' S$, $56^{\circ}42' W$), state of Mato Grosso do Sul (Uetanabaro et al. 2007), to 26 lizard species, in Jalapão region ($10^{\circ}38' S$, $46^{\circ}48' W$), state of Tocantins (Vitt et al.

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2005) and Manso ($15^{\circ}17' S$, $55^{\circ}48' W$) region, state of Mato Grosso (Strüssmann 2000). In other well sampled localities, the number of registered species was around 20, such as in Brasília region ($15^{\circ}46' S$, $47^{\circ}55' W$) (17 species; Nogueira et al. 2005), municipality of São Domingos ($13^{\circ}23'S$, $46^{\circ}19'W$), in the state of Goiás (20 species; Werneck and Colli 2006), and Espora hydroelectric power plant ($18^{\circ}40' S$, $51^{\circ}51' W$), in municipality of Aporé, state of Goiás (18 species; Vaz-Silva et al. 2007).

Only few published studies characterize snake communities in the *Cerrado*. Long-term studies were carried out in *Estação Ecológica de Itirapina* ($22^{\circ}15' S$, $47^{\circ}49' W$), state of São Paulo (36 species; Sawaya et al. 2008), Jalapão region (46 species, Vitt et al. 2005), Brasília region (61 species; França et al. 2008), Espora hydroelectric power plant, in municipality of Aporé, state of Goiás (45 species; Vaz-Silva et al. 2007), Manso hydroelectric power plant, in municipality of Chapada dos Guimarães ($15^{\circ}27' S$, $55^{\circ}44' S$), state of Mato Grosso (44 species; Strüssmann 2000), and Luis Eduardo Magalhães hydroelectric power plant ($10^{\circ}42' S$, $48^{\circ}25' W$), in Palmas, state of Tocantins (70 species; Pavan and Dixo 2004). The last three mentioned studies resulted from faunal rescue operations during flooding of areas that are currently occupied by hydroelectric impoundments.

Apart from biogeographical importance and lack of scientific knowledge, zoological studies on the *Cerrado* are highly relevant, as this region has been recognized as the one of the 25 global biodiversity hotspots, representing a priority target area for conservation actions (Myers et al. 2000). Over the past 35 years, more than half of the *Cerrado*'s original area has been transformed for agriculture, while only 2.2 % of it is area are under strict legal protection (Klink and Machado, 2005). The surroundings of the *Parque Nacional das Emas* (PNE) have suffered a severe loss of habitat due to the development of the agriculture in the last decades, and this region has been considered a priority area for conservation of *Cerrado* biodiversity, based on species richness and the occurrence of endemic, rare, and threatened species (MMA 2007).

Here we provide a checklist of the snake, lizard and amphisbaenian species found during a long term study on squamate reptiles in the PNE region, including Nascentes do Parque Estadual do Rio Taquari and ten neighbor private properties. We also provide comparisons among sampling sites, comments on *Cerrado* endemic species, and conservation issues.

Material and Methods

Parque Nacional das Emas ($18^{\circ}20' S$, $53^{\circ}00' W$, 760-880 m a.s.l.; Figures 1, 2 and 3) is a large (ca. 130,000 ha) preserved area of *Cerrado*, localized on a plateau dominated by interfluvial grassy scrubland (*campo sujo*) and *cerrado* grassland (*campo limpo*), although arboreal savannas are also present in smaller proportions (see detailed descriptions of *Cerrado* physiognomies in Ribeiro and Walter 1998). This plateau, classified as *Savanna Parque* (Figure 2 b) according to IBGE (2003) vegetation physiognomies, degrades to lower areas (600-700 m; Figure 1b) on the eastern border as well as outside the park, to the north (Araguaia River Basin), east (Jacuba-Correntes system, Paraná River Basin) and west (Taquari River Basin, Pantanal complex; Figure 2 a), in areas dominated by typical *cerrado* (*cerrado sensu stricto*), belonging to other five different vegetation physiognomies of *Savanna* vegetation class (IBGE 2003; Figure 2 b). Riparian habitats, such as wet grasslands (*campo úmido*) and gallery forests (*mata de galeria*) are present along water courses both inside and outside the park, as well as isolated patches of mesophytic forests.

The PNE encompasses areas belonging to the Paranaíba (Formoso, Jacuba and Correntes rivers) River Basin (Figure 2 b). We also sampled habitats not widespread inside PNE, such as typical *cerrado*, *cerradão* (woodlands) and wider gallery forests, mostly located in Taquari and Araguaia River Basins, not farther than 50 km from PNE (Figure 2). Sites outside PNE located in Araguaia River Basin are *Assentamento Nascentes do Araguaia*, Babilônia Farm and Jaboticaba Farm, in Mineiros, state of Goiás; Granada Farm, in Alto Taquari, and Sapo River region, in Alto Araguaia, both in the state of Mato Grosso. Sites located at Taquari River Basin are: Mutum Farm, Vista Bonita Farm and Planalto Farm in

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Alcinópolis, state of Mato Grosso do Sul; 13 Pontos Farm and Garrote Farm in Alto Taquari, state of Mato Grosso, and Saramandaia Farm in Alto Araguaia, state of Mato Grosso. Collecting

sites at Mutum, Planalto and 13 Pontos farms currently belong to Parque Estadual Nascentes do Rio Taquari (PENRT) (Figure 1, geographic coordinates in Appendix 2).

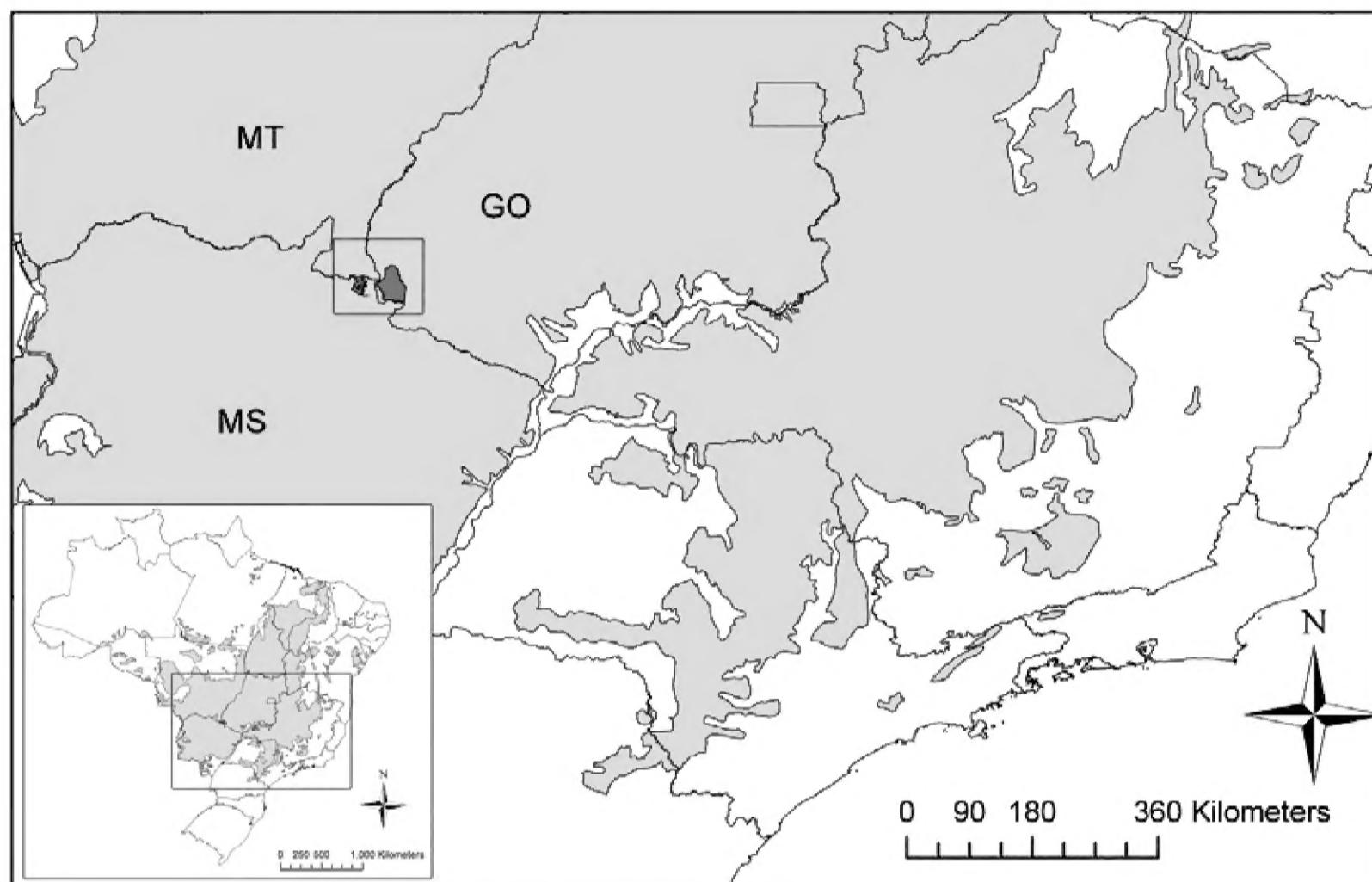


Figure 1. Map showing location of *Parque Nacional da Emas* (PNE) and *Parque Estadual Nascentes do Rio Taquari* (PENRT) in Brazil. Cerrado domain is represented in light green.

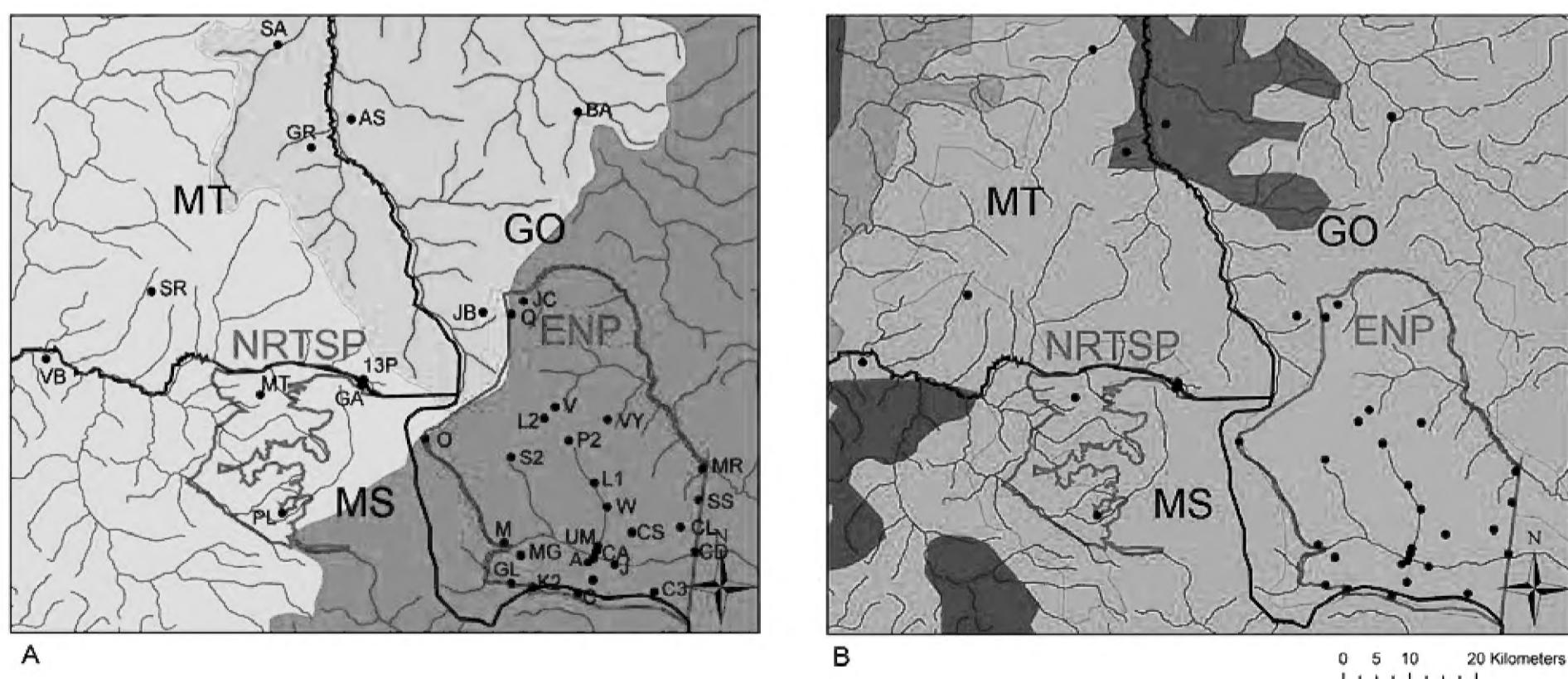


Figure 2. Location of *Parque Nacional da Emas* (ENP) and *Parque Estadual Nascentes do Rio Taquari* (NRTSP) (red lines) and sampling sites (black dots) according to A) hydrographic basin (light blue: Araguaia; dark blue: Paranaíba; pink: Taquari), and B) vegetation types (modified from IBGE 2003; light green: transition savanna - seasonal forest; dark green: woody savanna; yellow: farmlands; orange: grasslands; light brown: transition savanna - seasonal forest / farmlands; dark brown: forested savannas). Brazilian states are represented in black lines: MT - Mat Grosso; MS - Mato Grosso do Sul; GO - Goiás and rivers in blue lines.

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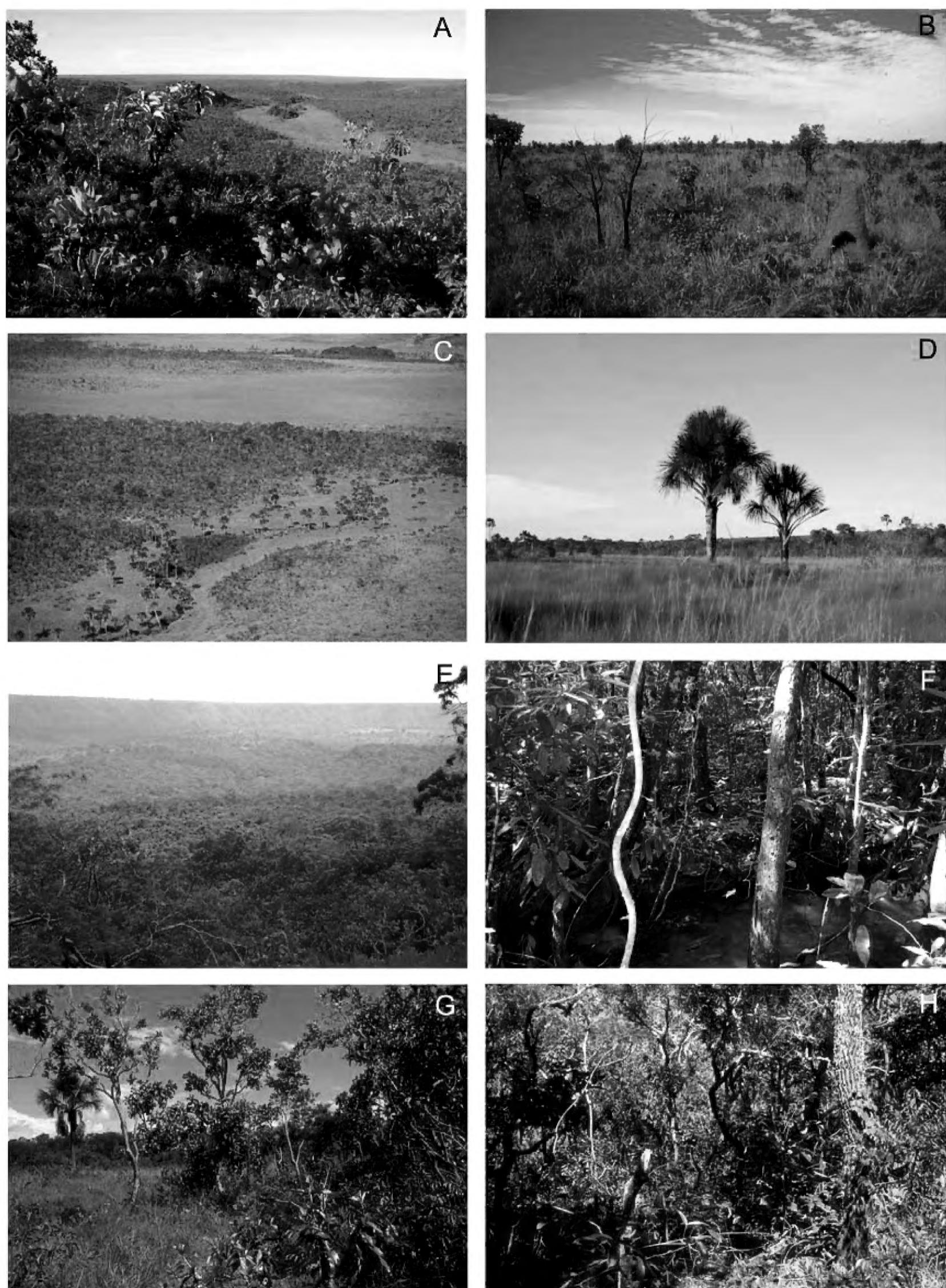


Figure 3. Some of the sample sites at *Parque Nacional da Emas* (PNE) and *Parque Estadual Nascentes do Rio Taquari* (PENRT), and in other locations in Araguaia and Taquari river basins. A. Overview of different *Cerrado* formations at PNE; B. Grassland, PNE; C. Aerial view, PNE; D. Marsh and typical cerrado at Sapo river region; E. Garrote Farm, PENRT; F. Gallery forest at Garrote Farm, PENRT; G. Marsh and typical *cerrado* at Vista Bonita Farm, Taquari River Basin; H. Dense *cerrado* at Saramandaia Farm, Taquari River Basin. Photos A-C, E-H: P. H. Valdujo; D: Carlos E. R. Cândido.

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Studies at PNE were performed from May 1997 to January 2001, in field trips lasting from five to 20 days, and during a long term sampling extending from 2 September 2001 to 20 February 2002. Taquari sites were sampled from 2 to 15 April 2000, and 20 March to 5 May 2002. Araguaia sites were sampled from 2 to 15 April 2000, 9 to 22 July 2000, and 3 to 30 July 2002 (IBAMA permit number 02001.002355/96-29).

Snakes were obtained in the field through 259.6 person-hour of time constrained search (TCS; Campbell and Christman 1982; Martins and Oliveira 1998) at PNE and about 60 person-hour in surroundings, about 25,000 km of road sampling (Fitch 1987) inside PNE, and not quantified outside, 20,388 pitfall traps-day (Corn 1994) inside PNE and 10,196 outside, and opportunistic encounters (all the snakes found in situations other than searching or sampling activities, including specimens collected by other researchers during their fieldwork, as in Jácomo and Silveira 1988). Lizards and amphisbaenians were found mostly through pitfall traps and opportunistic encounters. All collected specimens were deposited in the herpetological collections of Instituto Butantan (IB), Museu de Zoologia da Universidade de São Paulo (MZUSP), and Coleção Herpetológica da Universidade de Brasília (CHUNB). We also include specimens already available in these collections, as well as those deposited in Museu de Zoologia da Universidade Estadual de Campinas (ZUEC) or the herpetological collection of Universidade Católica de Goiás (CEPB), from former and unpublished studies. Taxonomic arrangements is

based on SBH (2009), Zaher et al. (2009) and Curcio et al. (2009).

Results and Discussion

We found 74 squamate reptile species inside PNE (Table 1, Figure 4 and 5, Appendix 1): 47 snakes, 21 lizards and six amphisbaenians. Other seven snake and six lizard species were found in areas sampled outside PNE, resulting in a regional richness of 87 squamate species. These 13 species were only found in PNE neighboring areas, located in Paranaíba, Taquari and Araguaia river basins, probably as an effect of differences in habitat structure inside and outside the park.

The number of species found in PNE represents 31 % of lizards, 25 % of amphisbaenians and 33 % of snakes known to occur in *Cerrado*, according to the list presented by Costa et al. (2007). If we include data obtained in PNE neighboring areas, values are raised to 40 % of lizards and 38 % of snakes. Eleven lizards (52 % of the total number of species in this group, at PNE), two amphisbaenians (33 %) and nine snakes (19 %) found inside PNE are *Cerrado* endemics. Therefore, we found higher proportions of *Cerrado* endemics than described in literature: according to Colli et al. (2002) 25 % of lizards, 10 % of snakes and 50 % of amphisbaenians occurring at *Cerrado* are endemic species. These differences may be explained by two main factors: knowledge on squamate reptiles' taxonomy and distribution has improved during the past six years, and we included previously undescribed, restricted range species, not included in Colli et al. (2002) results.

Table 1. Lizards, amphisbaenians, and snakes registered at *Parque Nacional das Emas* (PNE) and surroundings areas in Taquari (TA) and Araguaia (AR) river basins. Endemic species are marked with "^e". Site names and their geographic coordinates are listed in Appendix 2.

	ENP	TA	AR	SITES INSIDE PNE	SITES OUTSIDE PNE
LIZARDS					
Anguidae					
<i>Ophiodes striatus</i>	x		x	P2, GL, V, UM	AS
<i>Ophiodes</i> sp. ^e	x	x		P2	MT
Gekkonidae					
<i>Gymnodactylus amarali</i>	x			PNE	
Gymnophthalmidae					
<i>Bachia bresslaui</i> ^e	x	x	x	MR	SR, BA

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	ENP	TA	AR	SITES INSIDE PNE	SITES OUTSIDE PNE
<i>Cercosaura ocellata</i>	x	x	x	CA, SS, P2, GL, W, CL2, CC1, UM	SP, SR, VB
<i>Cercosaura schreibersii</i>	x	x	x	CA, CL, CS, SS, CD, P2, S3, W, L1, L2, C1, C3, V	BA, SR, VB
<i>Colobosaura modesta</i>	x	x	x	CS, CD	BA, VB, PL
<i>Micrablepharus atticolus</i> ^e	x	x	x	CA, SS, CD, GL, MR	BA, JB, AS, SP, SR, VB, MT
<i>Micrablepharus maximiliani</i>		x			SR, VB
<i>Vanzosaura rubricauda</i>		x	x		AS, SR, VB, GR
Hoplorcercidae					
<i>Hoplocercus spinosus</i> ^e	x			SS	
Polychrotidae					
<i>Anolis meridionalis</i> ^e	x	x	x	CA, CS, CL, SS, P2, GL, JC, S3, S2, L1, L2, C1, C3, V, A	BA, AS, SR, VB
<i>Polychrus acutirostris</i>	x		x	CA, W, V, VY	JB
Scincidae					
<i>Mabuya bistrigata</i>		x	x		VB, BA
<i>Mabuya dorsivittata</i>	x		x	P2, S3, L1, L2, C1	VB
<i>Mabuya frenata</i>	x	x	x	SS, CD, MG, L1, C1, L2, C3, V	BA, SP, VB, GR
<i>Mabuya guaporicola</i> ^e	x		x	CA, CS, CL, SS, CD, P2, L1, L2, C1, V, O,	AS
Sphaerodactylidae					
<i>Coleodactylus brachystoma</i>		x			VB
Teiidae					
<i>Ameiva ameiva</i>	x	x	x	SS, CD, P2, W, S2, L2, C3, V	BA, JB, AS, SP, SR, VB, 13P, MT, GR, GA
<i>Cnemidophorus aff. ocellifer</i> ^e	x	x	x	CA, SS	BA, AS, SP, SR, VB, GR
<i>Cnemidophorus aff. parecis</i> ^e	x	x		CA, CS, CL, P2, S3, W, S2, L2, C1, C3	SR
<i>Kentropyx paulensis</i> ^e	x	x		CA, CS, CL, SS, CD, P2, GL, W, L1, L2, C1, C3, V, A	MR, VB
<i>Tupinambis merianae</i>	x	x		UM	SP
<i>Tupinambis duseni</i> ^e	x			CS, CL, SS, P2, K2, S2, L2, V, UM	
Tropiduridae					
<i>Stenocercus sinesaccus</i>			x		BA
<i>Tropidurus guarani</i>		x			SR, VB, MT
<i>Tropidurus aff. etheridgei</i> ^e	x	x	x	SS, CD, JC, V	BA, JB, AS, SP, SR, VB, PL, GA
AMPHISBAENIANS					
Amphisbaenidae					
<i>Amphisbaena alba</i>	x		x	K2, P2, CS	
<i>Amphiabaena anaemariae</i> ^e	x			CL	
<i>Amphisbaena mertensii</i>	x		x	A, K2	GR
<i>Amphisbaena silvestrii</i> ^e	x		x	PNE	GR
<i>Amphisbaena vermicularis</i>	x			PNE	
<i>Cercophis roberti</i>	x			PNE	
SNAKES					
Anomalepididae					
<i>Liophlops ternetzii</i> ^e	x			CA	
Leptotyphlopidae					
<i>Leptotyphlops koppesi</i> ^e	x	x		CA, SS, P2, C1, C3	GA
Typhlopidae					
<i>Typhlops brongersmianus</i>		x	x		VB, GR
Boidae					
<i>Boa constrictus</i>	x	x		CD, P2	
<i>Epicrates crassus</i>	x			ENP	

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	ENP	TA	AR	SITES INSIDE PNE	SITES OUTSIDE PNE
<i>Eunectes murinus</i>	x			UM	
Colubridae					
<i>Chironius exoletus</i>		x		PL	
<i>Chironius quadricarinatus</i>	x			A, JC, P2	
<i>Drymoluber brasili</i>	x			SS	
<i>Mastigodryas bifossatus</i>	x			GL, C, O	
<i>Simophis rhinostoma</i>	x			K2	
<i>Spilotes pullatus</i>	x	x		O	
<i>Tantilla melanocephala</i>	x			CA, P2, S3, W, S2, L1, L2, C1, C3, C2, U2, Q, A, O	
Dipsadidae					
<i>Apostolepis assimilis</i>	x			K2, Q	
<i>Apostolepis aff. lineata</i>	x			CA, U2	
<i>Atractus albuquerquei</i>	x			W	
<i>Helicops gomesi</i> ^e	x			O	
<i>Helicops polylepis</i>		x			VB
<i>Erythrolamprus aesculapii</i>	x			JC, U2	
<i>Imantodes cenchoa</i>	x			JC	
<i>Leptodeira annulata</i>	x			PNE	
<i>Liophis almadensis</i>	x			GL, U2, UM	
<i>Liophis frenatus</i>	x			PNE	
<i>Liophis maryellena</i> ^e	x			P2	
<i>Liophis poecilogyrus</i>	x			PNE	
<i>Liophis reginae</i>	x	x		MG	
<i>Liophis typhlus</i>		x			13P
<i>Lycophis meridionalis</i>	x			PNE	
<i>Lycophis paucidens</i>		x			AS
<i>Mussurana quimi</i>	x			UM	
<i>Oxyrhopus guibei</i>	x	x		PNE	PL, GA
<i>Oxyrhopus petola</i>	x			J	
<i>Oxyrhopus rhombifer</i>	x	x		P2, K2, L2, C1, V, A	AS
<i>Oxyrhopus trigeminus</i>	x			PNE	
<i>Phalotris nasutus</i> ^e	x	x	x	W	AS, 13P
<i>Philodryas aestiva</i>	x	x		CA, CS, SS, P2, GL, JC, W, V, U2, Q, UM	AS
<i>Philodryas livida</i> ^e	x	x		CA, P2, W, V, U2	AS
<i>Philodryas nattereri</i>		x			AS
<i>Philodryas olfersii</i>		x			13P
<i>Philodryas patagoniensis</i>	x	x		P2, C, L1, L2, C2	AS
<i>Phimophis guerinii</i>	x			C, V, U2, A,	
<i>Pseudoboa nigra</i>	x	x		SS	VB, GA
<i>Rhachidelus brasili</i>	x			P2, W	
<i>Sibynomorphus mikanii</i>	x			GL, K2, U2, A, W, P2	
<i>Taeniophallus occipitalis</i>	x	x		S2, U2, W, UM	
<i>Thamnodynastes hypoconia</i>	x	x		CA, UM	VB
<i>Xenodon merremii</i>	x	x		CS, Q, A, O	
<i>Xenodon nattereri</i> ^e	x			SS	
Elapidae					
<i>Micrurus frontalis</i>	x	x		P2, V, O	SR, 13P
<i>Micrurus lemniscatus</i>	x			PNE	
Viperidae					
<i>Bothrops alternatus</i>	x			CA, CS, P2, M, K2, C, W, L1, A, UM, O	

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	ENP	TA	AR	SITES INSIDE PNE	SITES OUTSIDE PNE
<i>Bothrops moojeni</i> ^e	x	x		CD, UM	MT
<i>Bothrops pauloensis</i> ^e	x	x		CA, CS, CL, SS, P2, M, J, K2, C, W, L2, C1, C3, V, U2, Q, A, O	AS, VB, 13P
<i>Crotalus durissus</i>	x	x	x	CS, C, O	AS, 13P, GR

We did not find inside PNE many of the forest-specialists lizards collected at neighboring areas, such as *Mabuya bistriata*, *Coleodactylus brachystoma*, *Stenocercus sinesoccus*, the first two registered at Taquari River sites and the last, at Araguaia River sites. This is probably an effect of the lower availability of forested habitats inside PNE, compared to its surrounding areas.

Many additional species are still expected to occur in the PNE and surroundings, in view of their known geographical ranges. Recently Vaz-Silva et al. (2007) listed 45 snakes, 18 lizards and five amphisbaenians for the Espora Hidroelectrical Power Plant, in Aporé region, close to PNE. Among these, two amphisbaenians and seven snakes, five of them forest specialists or aquatic species, were registered for Aporé, but not for PNE region. Due to the short distance between sites and the general similarity between the two assemblages the nine above mentioned species are also expected to occur in PNE surroundings.

Conservation Implications: We found that PNE and PENRT together protect at least 79 out of 88 sampled squamate species. The PNE protects a rich reptilian fauna, highly representative of the herpetofauna of the Upper Paraná River Basin, in the southern portion of the *Cerrado*, one of the most disturbed regions in the domain (Machado et al. 2004; Redford 1985). Also, because of its more than 130,000 ha, PNE can protect significant populations of *Cerrado* Squamates, including some grassland-specialist species, which have lost most of their habitats outside the park, such as the lizards *Kentropyx paulensis*, *Anolis meridionalis*, *Tupinambis duseni* and the snakes *Philodryas livida*, and *Rhachidelus brazili*.

However, 18.6 % of the lizard species found in PNE surroundings may be regionally unprotected: three of them (*C. brachystoma*,

M. bistriata and *S. sinesoccus*) are mostly forests inhabitants, although *M. bistriata* can also be found in open areas in other localities at Mato Grosso state (C. Strussmann, pers. com.). Two other species (*M. maximiliani* and *V. rubricauda*) are regionally restricted to sandy soil savannas, and are both among the most common species at Vista Bonita and Saramandaia farms, Taquari basin. Although *M. atticolus* and *C. aff. ocellifer* are also sandy soil areas inhabitants, this habitat is extremely restricted inside PNE, and are much more common at both Araguaia and Taquari basins. We expect to find other species (mainly snakes and/or forest-specialist species) outside PNE, and it is possible that a greater proportion of the regional fauna will be found after new studies in *Cerrado* remnants outside the protected sites, as we spent the great majority of our collecting efforts inside PNE.

Natural landscapes around PNE are highly threatened by the expansion of mechanized agriculture, and many species may be lost if not protected by public or private reserves. We suggest that new conservation units must be planned for the region, aiming to protect lowland habitats at Araguaia and Taquari river basins and act as a complement on regional conservation efforts.

Our results indicate that snake assemblages in *Cerrado* show higher richness levels than previously suspected, corroborating recent conclusions regarding Squamate diversity in Central Brazil (Costa et al. 2007; Recoder and Nogueira 2007; Vaz-Silva et al. 2007). We suggest that long-term studies are necessary to properly evaluate species richness and composition of *Cerrado* squamate fauna, especially with regard to snakes and amphisbaenians.

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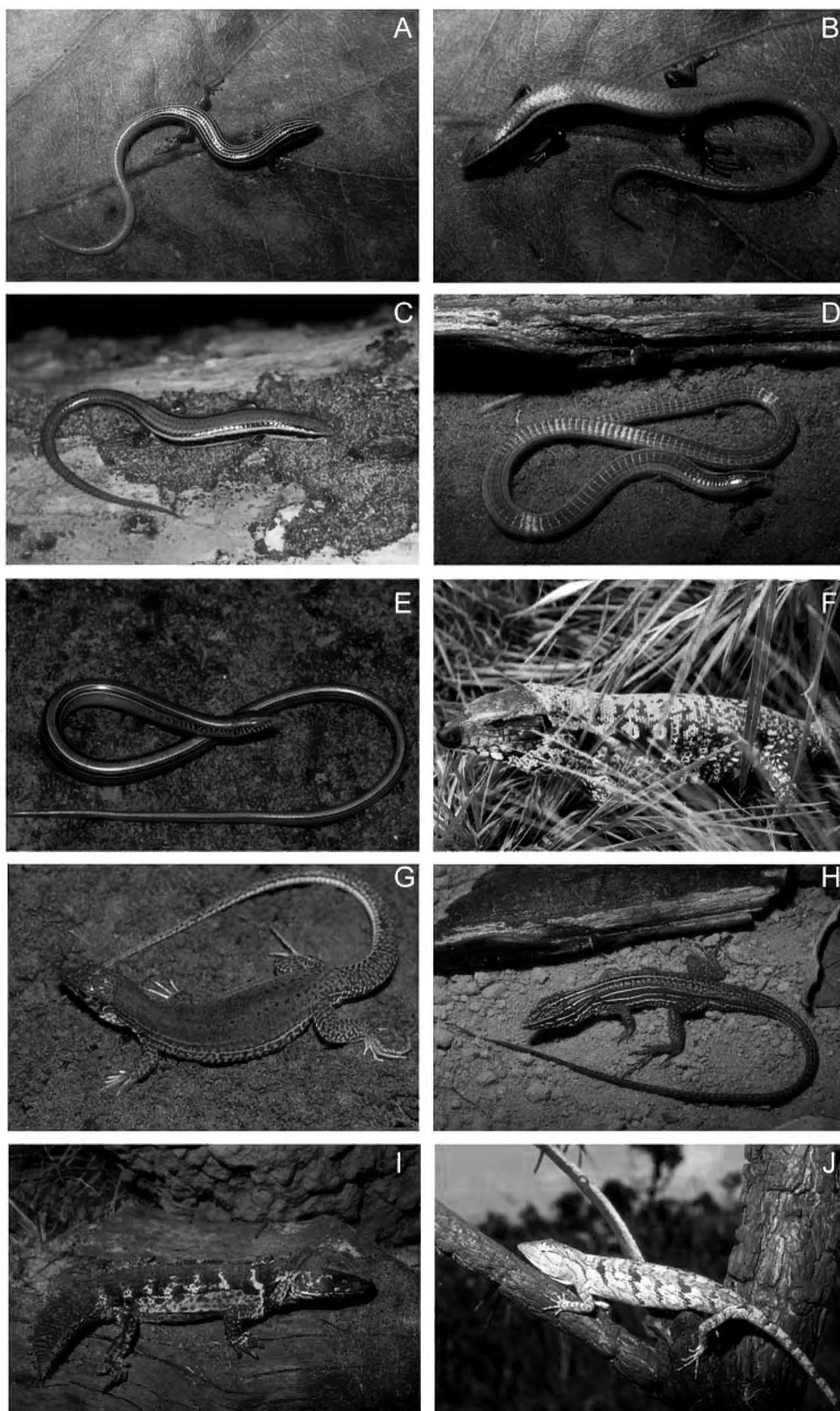


Figure 4. A. *Vanzosaura rubricauda*; B. *Micrablepharus maximiliani*; C. *Micrablepharus atticolus*; D. *Bachia bresslaui*; E. *Ophiodes striatus*; F. *Tupinambis duseni*; G. *Cnemidophorus* aff. *parecis*; H. *Kentropyx paulensis*; I. *Hoplocercus spinosus*; J. *Polychrus acutirostris*. Photos by P. H. Valdujo.

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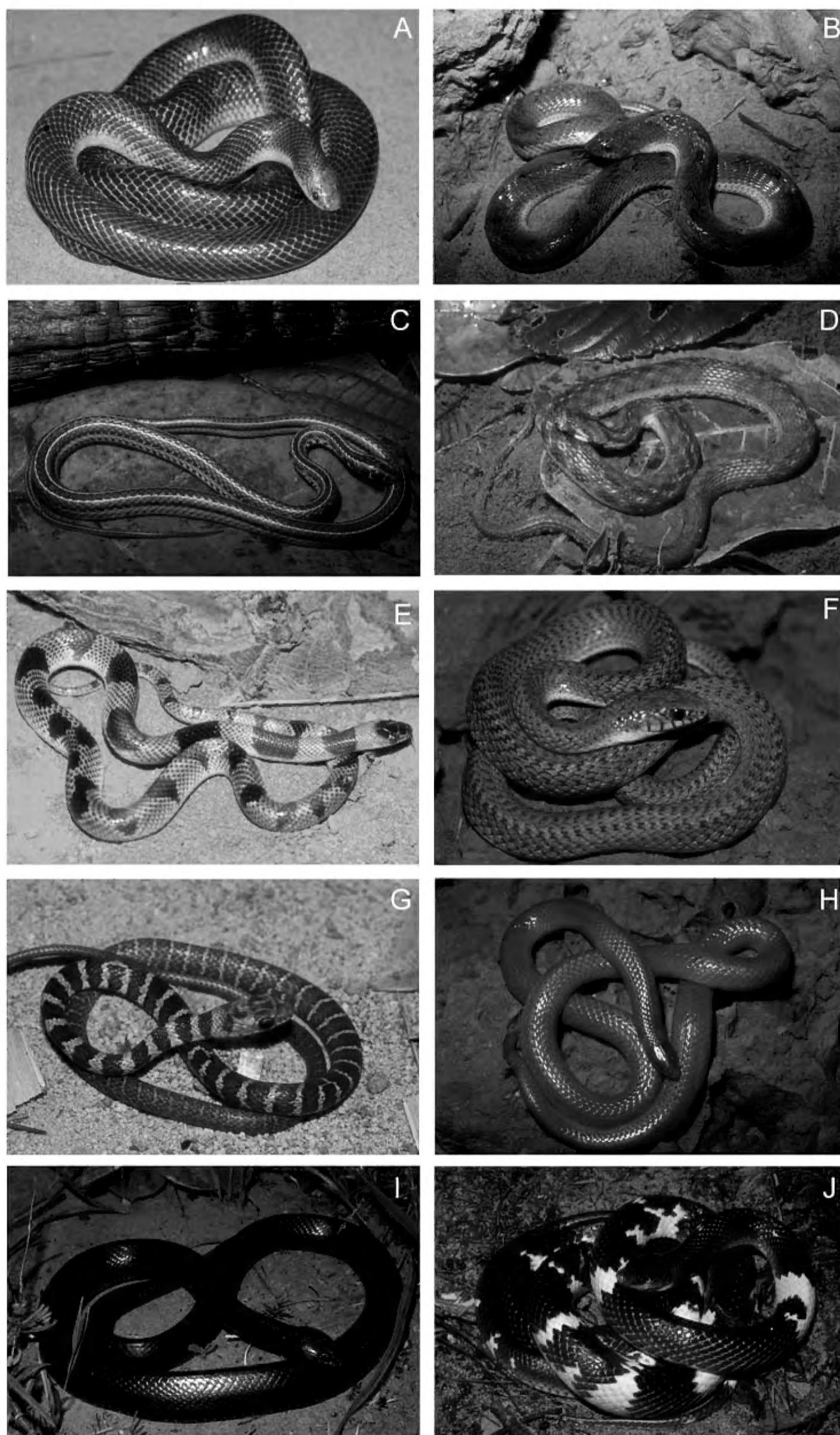


Figure 5. A. *Phimophis guerini*; B. *Xenodon nattereri*; C. *Lygophis meridionalis*; D. *Helicops polylepis*; E. *Oxyrhopus rhombifer*; F. *Philodryas livida*; G. *Drymoluber brasili*; H. *Phalotris nasutus*; I. *Rhachidelus brasili*; J. *Pseudoboa nigra*. Photos by P. H. Valdujo.

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Appendix 1

Voucher specimens (CHUNB – Coleção Herpetológica da Universidade de Brasília, MZUSP – Museu de Zoologia da Universidade de São Paulo, IB – Coleção do Instituto Butantan, ZUEC – Museu de Zoologia da Universidade Estadual de Campinas).

LIZARDS: *Ameiva ameiva* (CHUNB 12732 to 12734); *Anolis meridionalis* (CHUNB 11586-90); *Bachia bresslaui* (CHUNB 28089); *Cercosaura ocellata* (CHUNB 12727, 12728); *C. schreibersii* (CHUNB 11550); *Cnemidophorus* aff. *ocellifer* (CHUNB 11569, 32764, 32765); *C. aff. parecis* (CHUNB 25734-36); *Coleodactylus brachystoma* (CHUNB 28084-88); *Colobosaura modesta* (CHUNB 23757 and 23758); *Gymnodactylus amarali* (CHUNB 0864); *Hoplocercus spinosus* (CHUNB 25634); *Kentropyx paulensis* (CHUNB 11562-65); *Mabuya dorsivittata* (CHUNB 11557, 23759); *M. frenata* (CHUNB 11552, 11555); *M. guaporicola* (CHUNB 23762-66); *M. bistriata* (CHUNB 23761, 32752-53, MZUSP 69856); *Micrablepharus atticolus* (CHUNB 11581, 11583); *M. maximiliani* (CHUNB 23744 to 23750); *Ophiodes* sp. (CHUNB 23716, MZUSP 87601); *O. striatus* (CHUNB 23717 to 23720); *Polychrus acutirostris* (CHUNB 11572, 11574, 11576); *Stenocercus sinesaccus* (CHUNB 32754); *Tropidurus* aff. *etheridgei* (CHUNB 24506, 24510, 24515, 24531); *T. guarani* (CHUNB 24463-67); *Tupinambis duseni* (CHUNB 24850 to 24855); *T. merianae* (not collected); *Vanzosaura rubricauda* (CHUNB 24951-60).

AMPHISBAENIANS: *Amphisbaena alba* (CHUNB 12721, 12722, 12724; MZUSP 87659); *A. anaemariae* (CHUNB 33960-61, 33965-66); *A. mertensii* (MZUSP 88658, CHUNB 33963-64); *A. silvestrii* (MZUSP 87733, 88659); *A. vermicularis* (CHUNB 33963, 33964); *Cercophis roberti* (CHUNB 33962).

SNAKES: *Apostolepis* aff. *lineata* (IB 62693); *A. assimilis* (IB 62649); *Atractus albuquerquei* (IB 58934); *Boa constrictor* (IB 62697, CHUNB 28157); *Bothrops alternatus* (IB 57085 and 57086); *B. moojeni* (IB 58199-01, 60415, 61671, 61692); *B. pauloensis* (IB 58206-22); *Chironius quadricarinatus* (IB 62684); *C. exoletus* (CHUNB 23796); *Crotalus durissus* (IB 57084); *Drymoluber brasili* (IB 62682); *Epicrates crassus* (ZUEC 01958); *Erythrolamprus aesculapii* (IB 62686); *Eunectes murinus* (not collected); *Helicops gomesi* (IB 62688); *H. polylepis* (CHUNB 25951-52); *Imantodes cenchoa* (IB 62689); *Leptodeira annulata* (IB 57135); *Leptotyphlops koppesi* (IB 58708); *L. almadensis* (CHUNB 23726, 23778, 23797, 24550); *L. frenatus* (IB 62704); *L. maryellenae* (IB 62691, CHUNB 24560, 24573); *L. poecilogyrus* (IB 62703); *L. reginae* (IB 62683, CHUNB 25955); *L. typhlus* (CHUNB 21857); *Lygophis meridionalis* (IB 62681, CHUNB 24554); *L. paucidens* (IB 62696); *Liopholops ternetzii* (not deposited); *Mastigodryas bifossatus* (IB 62701); *Micrurus frontalis* (CHUNB 03914, ZUEC 01959, MZUSP 11731); *M. lemniscatus* (ZUEC 01955);

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Mussurana quimi (CHUNB 25707, 25958); *Oxyrhopus trigeminus* (IB 62699); *O. guibei* (IB 62695); *O. petola* (CHUNB 23732, 25705); *O. rhombifer* (CHUNB 25702); *Phalotris nasutus* (CHUNB 03892, ZUEC 01915); *Philodryas aestiva* (CHUNB 03624); *P. livida* (IB 57338, CHUNB 20306); *P. nattereri* (IB 62702); *P. patagoniensis* (CHUNB 18440); *Philodryas olfersii* (CHUNB 32748); *Phimophis guerini* (IB 56959, CHUNB 23734, 24562, 25700); *Pseudoboa nigra* (IB 62698); *Rhachidelus brazili* (CHUNB 25708 and 25709); *Sibynomorphus mikani* (IB 62685, CHUNB 23725, 23727); *Simophis rhinostoma* (IB 62687); *Spilotes pullatus* (IB 62700); *Taeniophallus occipitalis* (IB 62692, CHUNB 24540, 25724-26); *Tantilla melanocephala* (CHUNB 23721-24, 25717); *Thamnodynastes hypoconia* (IB 62690); *Typhlops bronigersmianus* (CHUNB 28147 and 28148); *Xenodon merremii* (ZUEC 01953); *Xenodon nattereri* (CHUNB 25706).

Appendix 2

Sites inside PNE: CA ($18^{\circ}15'05"S$, $52^{\circ}53'06"W$), CS ($18^{\circ}13'33"S$, $52^{\circ}50'14"W$), CL ($18^{\circ}13'08"S$, $52^{\circ}46'17"W$), SS ($18^{\circ}10'54"S$, $52^{\circ}44'47"W$), CD ($18^{\circ}15'07"S$, $52^{\circ}45'06"W$), MG ($18^{\circ}15'23"S$, $52^{\circ}59'14"W$), P2 ($18^{\circ}06'07"S$, $52^{\circ}55'21"W$), M ($18^{\circ}14'22"S$, $53^{\circ}00'39"W$), GL ($18^{\circ}17'41"S$, $53^{\circ}00'01"W$), JC ($17^{\circ}54'44"S$, $52^{\circ}59'02"W$), J ($18^{\circ}16'30"S$, $52^{\circ}51'18"W$), S3 ($18^{\circ}17'25"S$, $52^{\circ}53'23"W$), K2 ($18^{\circ}17'59"S$, $52^{\circ}58'13"W$), C ($18^{\circ}18'35"S$, $52^{\circ}54'37"W$), W ($18^{\circ}11'30"S$, $52^{\circ}52'12"W$), S2 ($18^{\circ}07'26"S$, $53^{\circ}00'03"W$), C1 ($18^{\circ}14'42"S$, $52^{\circ}52'57"W$), C3 ($18^{\circ}18'23"S$, $52^{\circ}48'24"W$), V ($18^{\circ}03'23"S$, $52^{\circ}56'27"W$), U2 ($18^{\circ}00'36"S$, $52^{\circ}58'24"W$), Q ($17^{\circ}55'45"S$, $53^{\circ}00'01"W$), A ($18^{\circ}15'57"S$, $52^{\circ}53'49"W$), MR ($18^{\circ}08'24"S$, $52^{\circ}44'30"W$), VY ($18^{\circ}05'20"S$, $52^{\circ}52'01"W$), UM ($18^{\circ}15'38"S$, $52^{\circ}53'20"W$), O ($18^{\circ}05'59"S$, $53^{\circ}06'59"W$).

Sites outside PNE – Araguaia basin: BA (Babilônia Farm, $17^{\circ}39'22"S$, $52^{\circ}54'35"W$), JB (Jaboticaba Farm, $17^{\circ}55'S$, $53^{\circ}02'W$), AS (*assentamento Nascentes do Araguaia*, $17^{\circ}39'52"S$, $53^{\circ}13'02'W$), SP (Sapo river region, $17^{\circ}33'56"S$, $53^{\circ}18'58"W$), GR (Granada Farm, $17^{\circ}42'17"S$, $53^{\circ}16'13"W$); Taquari basin: SR (Saramandaia Farm, $17^{\circ}53'56"S$, $53^{\circ}29'13"W$), VB (Vista Bonita Farm, $17^{\circ}59'29"S$, $53^{\circ}37'45"W$), 13P (13 Pontos farm, $18^{\circ}01'13"S$, $53^{\circ}12'00"W$), GA (Garrote Farm, $18^{\circ}01'38"S$, $53^{\circ}12'45"W$), MT (Mutum Farm, $18^{\circ}02'21"S$, $53^{\circ}20'25"W$), PL (Planalto Farm, $18^{\circ}11'58"S$, $53^{\circ}18'38"W$).